Department of the Navy
Plasma Sound Source Ocean Test
Coastal Consistency Negative Determination

26 MAY 1999

This Coastal Consistency Negative Determination (CCND) has been prepared by the U.S. Department of the Navy (DON) to evaluate potential environmental impacts of at-sea demonstration testing of a Plasma Sound Source (Plasma Sound Source), an active impulsive acoustic undersea surveillance subsystem during the period from mid-August through 30 September 1999. Specifically, this Coastal Consistency Negative Determination evaluates an ocean test that is proposed for a location within U.S. territorial seas and outside of California coastal zone waters off the coast of Southern California. The Plasma Sound Source Ocean Test is intended to demonstrate that an existing developmental passive receiver array could potentially obtain enhanced performance through operations with a Plasma Sound Source.

This document is in two parts: a project description (page 1) and a specific analysis of the consistency of the project with the provisions of the California Coastal Act (page 13).

PART I: PROJECT DESCRIPTION

The Plasma Sound Source array consists of a 10 meter long string of 80 sparkplug-like and size devices, which produce split second broadband impulsive sounds. A photograph of a single Plasma Sound Source sparker element is included as Figure 1.

Figure 1. Plasma Sound Source sparker element. *U.S. Navy photo*

The Navy proposes to use the Plasma Sound Source, along with a passive receive array, to help detect underwater and surface marine vessel activity. The Plasma Sound Source active acoustic test source would be used to produce pulsed sound during the proposed test to evaluate the potential for active pulsed sound to enhance the performance of passive sonar systems. To the greatest extent possible, Plasma Sound Source components have been and will continue to be tested in the laboratory. However, to obtain realistic testing conditions and to deploy full-scale hardware, certain tests must be performed in the ocean environment. A single demonstration test over a 22-day period between mid-August and 30 September 1999 is proposed to evaluate the capability and performance of a Plasma Sound Source array. Table 1 summarizes the test parameters.

Table 1. **Summary of Plasma Sound Source Ocean Tests**

Key Test Parameters	Demonstration Test
TEST CHARACTERISTICS	
Maximum Test Period (Active)	8 days
Number of Test Vessels	2
Wet-end Inspection and Repair*	Yes
Component Retrieval	Yes
ACOUSTIC PARAMETERS	

Maximum Active Acoustic Testing (daylight only)	56 hours
Plasma Sound Source (Plasma Sound Source)	
Energy Source Level ***	219 dB re 1 m Pa^2-sec**
Frequency Range	300 - 650 Hz
Pulse Duration	2.5 milliseconds
Range of time between pulses	15 seconds to days

* Wet-end inspection and repair would occur only as required.

** Total energy per impulse on the major response axis. Corresponds to a source level of 190 dB re 1 m Pa^2/Hz spectrum level below 1 kHz. Measurement units and conventions in this document follow those used in Richardson et al., 1995.

*** Energy Source Level refers to the measurement of the energy in an acoustic transmission at a distance of 1m from the source.

Activities associated with the proposed ocean test would primarily include the following: anchoring of the test barge, deployment of the active array to approximately 80 meters (262-ft) in water of about 91- m (300-ft) depth, inspection and operation of the system, and retrieval of the system. In addition, a 36.6-m (120-ft) passive acoustic array (3.8-cm [1.5-inch] diameter) would be deployed and laid on the ocean floor. It would be connected via a fiber optic cable (0.38-cm (0.15-inch) diameter, no more than 3 kilometers in length) to the van enclosure located on the barge.

Deployment of the Plasma Sound Source System. A full-scale test of the Plasma Sound Source system in the ocean would include testing the handling and deployment systems, as well as deploying approximately one hundred meters of cable from a moored barge to a mid-water column location. This active array is the focus of this Coastal Consistency Negative Determination, and represents a proof-of-concept demonstration of the technology. To use the barge for receiving and processing the data associated with the Plasma Sound Source ocean test, use would be made of a bottom-laid passive array 3.8-cm (1.5 inches) in diameter, which would be connected to the barge via a 0.38 cm diameter fiber optic cable. The intended location of the moored array is 6.5 to 8.3 km (3.5 to 4.5 nm) off of the coast of Camp Pendleton in approximately 91 m (300 ft) of water. The deployment configuration of the system is shown in Figure 2.

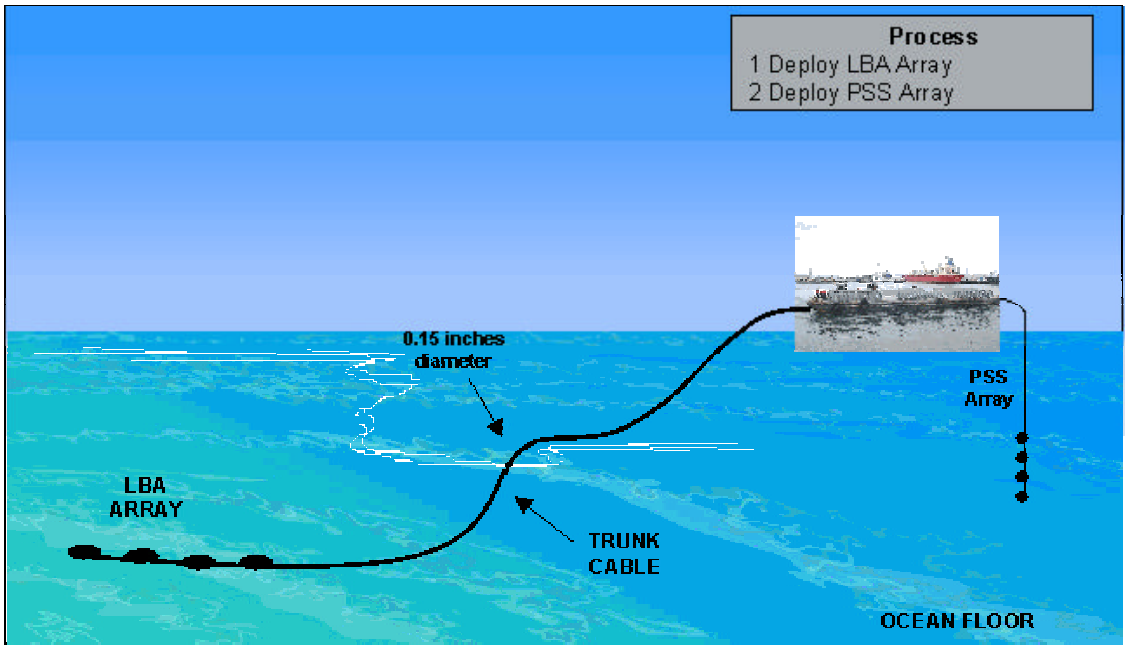

Figure 2. Deployment of the system. *U.S. Navy graphic*

Passive Array Placement. The fiber optic cable (0.38 cm diameter) from the bottom-laid Mobile Inshore Undersea Warfare (MIUW) passive LBA array would be connected to the van enclosure on the barge. Cable would then be deployed from a reel on a 27-ft workboat and the passive acoustic array would be attached to the fiber optic cable and deployed from this vessel at the desired location. The passive receive array and cabling system is already in use by the Navy in support of research and development testing.

Operation and Inspection of the System. The Plasma Sound Source array is an active acoustic subsystem, that would produce impulsive sound during the ocean demonstration test. A single active acoustic method is proposed. A moored Plasma Sound Source array using a brief (microseconds in duration) electrical arc similar to that generated at the end of a sparkplug, generates sound through the creation of a bubble of ionized water that then collapses and returns to a liquid state over a period of milliseconds. This Plasma Sound Source system will produce sounds similar to (but quieter than) air gun arrays used in seismic surveys, which are already approved for commercial operations via an existing categorical exclusion. Inspection and repair of the Plasma Sound Source system would be performed only as required.

Retrieval of the System. Retrieval of all components of the Plasma Sound Source array and the passive receive array would occur within two weeks after completion of the demonstration test. The retrieval time is included in the 22-day test period.

Support Vessels and Personnel. As part of the Plasma Sound Source ocean test, two surface vessels and a test barge would be used to support deployment, inspection and operation (active acoustic testing), and retrieval of the system. One of the surface vessels would be used to establish and to demobilize the barge mooring. The other would be used for daily support and personnel transfer.

Personnel required for the ocean test (approximately 10 shipboard personnel [8 scientists and 2 crew members]) consists of those required to prepare test plans and procedures, assemble and inspect equipment prior to the start of at-sea testing, deploy in-water components, conduct various tests, collect data, retrieve equipment, analyze test results, and prepare reports. In many cases, the same person would perform several of these tasks. Not all would be on the barge at all times.

Selection of Test Site and Test Period.

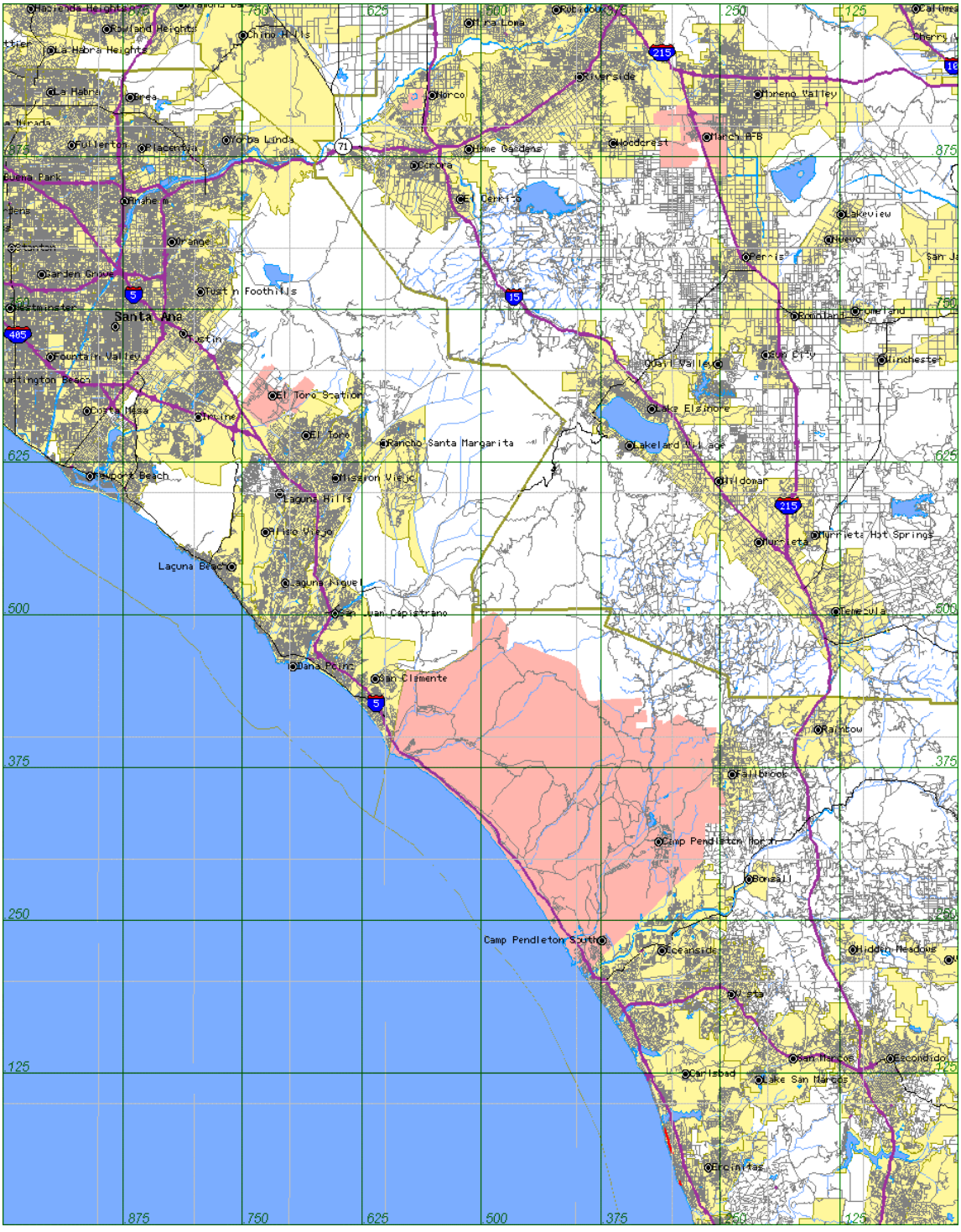

Figure 3. The proposed test site is located about four nautical miles off the California coastline adjacent to [Camp Pendleton Marine Corps Base](#).

The Department of the Navy proposes to conduct these tests within the marine environment of Southern California, between the northern and southern boundaries of Marine Corps Base (MCB) Camp Pendleton, outside of 3 nautical miles from land and more than 35 nautical miles south-southeast of Santa Catalina Island. The specific mooring location of the system is shown in Figure 3.

The tests would occur within a 22-day period including retrieval time. Once the system has been deployed, the maximum days of operation for the test would be approximately eight contiguous days; however, testing would not occur continually. A maximum of 56 hours of active acoustic testing, occurring only during daylight hours, using impulsive transmissions is proposed during the 22-day period. The maximum test period would consist of eight contiguous days for the test including data collection within the 22-day period.

Systematic operational parameters were analyzed to determine reasonable site locations for conducting the Plasma Sound Source ocean test. The siting process involved the development of specific operational siting criteria based on test objectives, which included the following:

- operational realism (adequate deployment area/depth/performance measurability);
- survivability (weather conditions/level of fishing/terrain);
- scheduling (low potential for schedule change);
- availability (test site is available for conduct of tests);
- accessibility (physically and economically feasible to reach test site);
- supportability (necessary amenities); and
- availability of opportunistic targets (critical due to the limited funding available to this Research & Development (R&D) effort).

Once operational criteria were identified, various regions were considered in a tiered analysis to identify potential siting locations for conducting Plasma Sound Source ocean tests. Operational criteria were first used to eliminate general areas from further consideration and, to compare advantages and disadvantages of potential alternative sites. Sites considered included the following:

- sites within U.S. territorial seas; and
- foreign sites.

Foreign sites for Plasma Sound Source ocean testing were eliminated from further consideration due to the following reasons:

- high potential for schedule changes, or equipment damage due to weather, political atmosphere, or unknown variables;
- sites outside the U.S. are usually restrictive to R&D programs; and
- support functions (e.g., electricity, lodging, etc.) are highly variable and expensive at remote locations.

Therefore, U.S. territorial seas were identified as the only viable siting option.

In the next tier of analysis, based on the alternatives analysis, the East Coast, Hawaii, and the Gulf Region were eliminated from further consideration because they did not meet all operational siting criteria. Based on this tiered analysis, the West Coast was identified as the only area that met all operational siting criteria for implementation of the Plasma Sound Source ocean test.

Once the West Coast was identified as the only region that met all operational siting criteria, specific West Coast ocean test site locations were evaluated. More detailed operational criteria were used to further determine the characteristics of the proposed ocean test. The location that satisfied all required operational criteria is analyzed in this Coastal Consistency Negative Determination. This location consists of the proposed Plasma Sound Source ocean test site, located offshore of Southern California. Testing at another location or during

another period was deemed not feasible due to: 1) asset availability, 2) availability of pertinent personnel, and 3) programmatic costs in relocating assets to other potential operational sites/times.

The only alternative to performing the proposed ocean test would be to simulate the ocean environment through laboratory testing. This alternative does not meet the purpose and need of the Plasma Sound Source ocean test since real world conditions and representative targets are necessary to verify and validate Plasma Sound Source capabilities.

Plasma Sound Source is proposed to be tested to demonstrate and validate the performance improvements allowed by bi-static active processing that would augment existing and planned passive Mobile Inshore Undersea Warfare (MIUW) receiving assets. If these tests are not conducted, the Navy's objective of developing a validated, demonstrated bi-static active upgrade to passive MIUW sonar systems would be substantially delayed until another opportunity for demonstration would occur.

This Coastal Consistency Negative Determination describes current baseline conditions and evaluates potential impacts from the implementation of Plasma Sound Source ocean testing at the proposed Plasma Sound Source ocean test location site. The Coastal Consistency Negative Determination includes descriptions of baseline conditions and environmental consequences outside California waters. The following environmental resources are addressed in the Coastal Consistency Negative Determination: geology, topography and soils; air quality; marine environment; marine biology; marine mammals; terrestrial biology; land use, transportation and recreation; socioeconomics; noise; cultural resources; and safety and environmental health. The key issue identified during preparation of this Coastal Consistency Negative Determination was the potential for acoustic impacts on marine mammals and divers. The analysis of potential acoustic impacts demonstrated that significant impacts on marine mammals and divers would not occur as a result of implementation of the proposed Plasma Sound Source ocean testing.

Monitoring and Mitigation Measures. In the resource-specific analysis as described in Table 4 of this Coastal Consistency Negative Determination, no significant impacts have been identified. The proposed Plasma Sound Source test is not intrusive and has been designed to further minimize environmental impacts. Monitoring and mitigation measures for marine mammals were established based on predicted received sound levels relative to distance from the sound sources as shown in Table 2 and are additional efforts designed to lessen any potential impact.

In order to determine the ranges at which marine mammals may potentially be affected by man-made sources of sound, three factors must be considered: 1) the acoustical characteristics of the source, 2) the propagation of sound through the ocean environment, and 3) the effects of received sound on marine mammals.

The first two factors are comparatively well understood. The acoustical characteristics of the Plasma Sound Source sound source were determined by laboratory measurement. The propagation of sound in the ocean environment was predicted by means of a simple calculation and also by use of a Navy computer program that mathematically models the acoustical characteristics of the ocean and sea floor.

The third factor, the effects of received sound on the animal, is the least understood and has been the subject of considerable controversy. The subject of marine mammal reactions to noise is a rapidly evolving field of science. Every effort has been made to use the best available peer reviewed data in conducting the analyses used to prepare this Coastal Consistency Negative Determination.

The available information on harassment of marine mammals by man-made noise is limited as to species, geographical area and type of noise source studied and has for the most part been derived from opportunistic studies. Those studies that are most directly applicable to this Coastal Consistency Negative Determination and this type of test indicate that for multiple short duration impulsive sounds (> 15 seconds to days between pulses for this testing), the harassment threshold for mysticetes would fall in the range of 180 (single impulsive event)

to 175 (multiple impulsive event) dB re 1 m Pa^2-sec (energy), with similar or higher thresholds for odontocetes and pinnipeds. Since this test event deals with multiple short duration impulse events occurring at a repetition rate of 15 seconds to days, the 175 dB threshold was deemed most directly applicable. Note: This is not the same decibel measurement scale that is used for measuring long duration tonal sounds, the "dB re 1 m Pa" (energy). Acoustical measurement units and conventions in this document follow those used in Richardson et al. (1995).

Calculations for the acoustic propagation from the Plasma Sound Source indicate that, at worst, the received energy levels will fall below 175 dB re 1 m Pa^2-sec (energy) at 0.16 kilometers (km) from the Plasma Sound Source active acoustic source. A distance of 0.2 km was therefore selected as the desired mitigation range in order to provide a buffer zone beyond the range calculated to which received energy level would drop below 175 dB re 1 m Pa^2-sec (energy) (0.16 km). Extending the zone to 0.2 km allows for a conservative margin of error in visual observation.

Table 2. Predicted Received Energy Source Levels Relative to Distance from Sound Source

Energy Source Level @ 1 m	**Received Energy Level**
219 dB re 1 m Pa^2-sec	180 dB re 1 m Pa^2-sec @ 0.09 km 175 dB re 1 m Pa^2-sec @ 0.16 km

Additional monitoring and mitigation measures have been recommended and incorporated into the Plasma Sound Source ocean test program to minimize any potential for acoustic impacts on marine mammals (Table 3).

Table 3. Monitoring and Mitigation Measures for Marine Mammals during Plasma Sound Source Ocean Test Acoustic Transmissions

Impulsive Acoustic Source	**Watch Type** *		
	Visual	**Dedicated**	**Operations Curtailed When**
219 dB re 1 m Pa^2-sec**	**X**	**X**	Mysticetes, pinnipeds or odontocetes within 0.2 km

* A visual or dedicated watch will begin 30 minutes before the start of any acoustic transmission and will continue for the duration of the transmission.

** Acoustic transmission during daylight hours only, and only when visibility exceeds 0.2 km.

For the proposed Plasma Sound Source ocean test, two types of visual searches for marine mammals would be conducted: (1) *a visual watch* by personnel whose primary duties involve safety of navigation, and 2) *a dedicated watch* of two personnel specifically trained in marine mammal identification who will have no other duties. A dedicated watch of waters within 0.2 km of Plasma Sound Source support vessels would be conducted at least 30 minutes before and continue during any impulsive sound source transmission.

Sound transmissions will occur only in daylight and only when weather conditions allow the visual watch to observe a minimum of 0.2 km in all directions around the moored barge from which the active acoustic source is deployed. If, for example, fog reduces visibility in the area below 0.2 km, acoustic transmissions will be halted until the visibility improves sufficiently to allow the visual watch to resume.

Effects on human divers will not occur due to the fact that diver operations will not be conducted in the vicinity of the test barge. The location of the tests will be kept free to a distance of 1 km of other activities for the efficiency and integrity of the testing. In addition, the planned location of the Plasma Sound Source test site is not near identified dive sites. Therefore, recreational divers shall not be affected by the test.

Implementation of the above measures would be incorporated into the Plasma Sound Source test plan and logged during the active transmission period of the Plasma Sound Source test. This data would include the logging of marine mammals sighted during the active transmission period.

Summary of Impacts. Determination of significant impacts requires the consideration of context and intensity. The significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the magnitude of the potential effect (i.e., the degree of reach in terms of strength, force, or energy per unit [e.g., time]). The analysis carried forth in the Coastal Consistency Negative Determination addresses the impacts of the proposed Plasma Sound Source test within the spatial and temporal boundaries of test implementation. The proposed activity of the use of typical seagoing vessels, and the short-term use of artificial underwater sound sources (the projector) have all been found to have highly localized influences (i.e., small regions of potential impact) that preclude the need to look at larger areas of influence. Thus, the context of potential impact for the Plasma Sound Source activities is limited to localized site-specific regions surrounding the sea test area.

Changes in the environment would be limited to a total of 22 days for the proposed test. Upon completion of the test, the marine environment within the proposed footprint area would remain essentially unchanged from its condition prior to the proposed action.

Intensity of impacts are measured against specific evaluative factors including public health; unique characteristics (e.g., sensitive ecological features); degree of controversy; degree of unknown or uncertain risk; precedent-setting impact; cumulative impact; archaeological and historic resources; special status species, and the potential to violate federal, state, and local laws. Based upon the detailed analysis presented in this Coastal Consistency Negative Determination, the intensity of effects associated with implementation of the proposed action is not significant since the proposed Plasma Sound Source test consists of highly localized, discrete actions that do not add in a cumulative manner to other activities in the general region. The Plasma Sound Source ocean test would have no significant impact on federally protected threatened and endangered species. All emissions associated with the proposed project would be consistent with the Coastal Zone Management Act (CZMA). There are no known archaeological resources that would be affected with implementation of the proposed action; therefore, there would be no significant impacts on cultural resources. The review for consistency with applicable environmental requirements at the federal, state, and local level found no threat of violation associated with the proposed action.

Additionally, OPNAV Instruction 5090.1B exempts from regulation acoustic sounds generated for geophysical exploration as listed in categorical exclusion number 22. This Coastal Consistency Negative Determination covers impulsive sound being produced that is similar in character, but lower in amplitude (energy) than those signatures produced by airguns on geophysical exploration arrays that have been used by the oil companies since the early 1950's. Because these sounds are very similar in their transient nature, and their infrequent transmission, individual pulses probably make a sound similar to distant thunder in the water. Current research findings suggest that geophysical exploration sounds do not cause any permanent hearing damage to mammals (Richardson, et al., 1995, p. 375) due to:

a. the transitory nature of seismic exploration,
b. the presumed ability of marine animals to tolerate exposure to strong calls from themselves and from other nearby mammals.

Due to the short-term localized nature of the Plasma Sound Source ocean test, the proposed action does not meet the criteria to be considered to contribute to cumulative impacts. No significant impacts would result from implementation of the proposed action. With the identified monitoring and mitigation efforts incorporated into the proposed Plasma Sound Source test, the impacts of the proposed action would be negligible. Summaries of the potential effects of the proposed Plasma Sound Source ocean test are provided in Table 4.

Table 4. Impact Summary Matrix (Page 1 of 3)

Resource	Plasma Sound Source Ocean Test/Southern California
Geology, Topography, and Soils	**Proposed Plasma Sound Source Ocean Test Location** Not-applicable (N/A)
Air Quality	**Proposed Plasma Sound Source Ocean Test Location** Air quality analysis concluded that emissions associated with the proposed ocean tests would be below *de minimis* levels for all nonattainment criteria pollutants. Impacts to air quality would not be significant as a result of implementation of the proposed action.
Marine Environment	**Proposed Plasma Sound Source Ocean Test Location** Water Quality: There would be no discharges to the surrounding marine environment. Use of the Plasma Sound Source would not result in contribution of pollutants to the seawater at the test site. Therefore, impacts on water quality would not be significant. Marine Sediments: Three anchors would be employed to stabilize the source platform. It is estimated that 200 m^2 /anchor would be momentarily disturbed during deployment and retrieval (600 m^2 total). Any sediment disturbance that would occur would be short-term and not significant.
Marine Biology	**Proposed Plasma Sound Source Ocean Test Location** Chemical Contamination: (refer to *Marine Environment,* water quality, above) Benthic Organisms: Plasma Sound Source anchoring and passive receive array components have been designed to minimize drag, limiting sediment disturbance. Therefore, increases in turbidity would be minimal and not significant. Other Plasma Sound Source components would be suspended in the water column. Fish: Given the moderate sound source level and short duration of exposure to maximum received levels, projected sounds would not affect the catchability or the hearing abilities of fish.
Marine Mammals	**Proposed Plasma Sound Source Ocean Test Location** Acoustic Impacts: Potential acoustic impacts of Plasma Sound Source ocean test operations on marine mammals vary with hearing capabilities of each major group. For example, mysticetes (baleen whales) may hear noise from both the project vessels and the Plasma

	Sound Source array. However, maximum source levels for the impulsive source (219 dB re 1 m Pa^2-sec, energy) are such that the area ensonified to levels above 175 dB is comparatively small. It is unlikely that odontocetes (toothed whales) or pinnipeds would be affected by either vessel or the moored Plasma Sound Source array due to comparatively poor hearing at frequencies less than or equal to 1 kHz. It is unlikely that any noise associated with Plasma Sound Source ocean test operations would be heard by sea otters due to their low numbers and exclusive occupation of coastal waters within 3 nm of shore. Mitigation measures have been incorporated to further minimize any potential for acoustic impacts to marine mammals.

Table 4. Impact Summary Matrix (Page 2 of 3)

Resource	Plasma Sound Source Ocean Test/Southern California
Marine Mammals (continued)	**Attraction/Collision**: The risk of attraction and collision would be the same as for other vessels operating in the area and would not be significant. The barge would be properly lighted and provided with Coast Guard regulated devices. A Notice to Mariners (NOTMAR) would be posted prior to test operations. **Entanglement**: Test components would be retrieved following testing. During operations, the potential for entanglement or ingestion would be remote based on the size and shape of cables and test components. The Plasma Sound Source array has been designed to hang straight; the Plasma Sound Source array would consist of several parallel lines extending more-or-less linearly and vertically over 10 m (33 ft) in a mid-water location. It is highly unlikely that any marine mammals would become entangled with this cable arrangement. No significant impacts on marine mammals would result. **Chemical Contamination**: Since there would be negligible chemical discharges associated with the Plasma Sound Source tests, there would be no risk of metal bioaccumulation in marine mammals (refer to *Marine Environment).* No significant impacts on marine mammals would result.
Terrestrial Biology	**Proposed Plasma Sound Source Ocean Test Location** Boating activities are common in the area and are not known to adversely affect sight-feeding bird species. Therefore, impacts to terrestrial species, including federally or state listed sensitive species, would not occur.
Land Use, Transportation, and Recreation	**Proposed Plasma Sound Source Ocean Test Location** The operation of two marine vessels would be consistent with offshore use in the Southern California Bight. In addition, exclusion areas have been established to avoid potential impacts to existing recreational resources. To minimize potential impacts to transportation, the ocean test

	would be sited to avoid major shipping lanes and heavily utilized military operation areas. In addition, since the test vessel would be deploying a moored device, a Notice to Mariners (NOTMAR) would be issued 48 hours prior to commencement of tests. For these reasons and due to the short-term nature of the test, impacts to marine traffic would not be significant.
Socioeconomics	**Proposed Plasma Sound Source Ocean Test Location** Commercial shipping traffic would not be significantly affected by the proposed action. Vessels could continue to operate within a 1.0-km (0.6-mile) radius of the test location without interfering with the integrity of the test. Given the small area of ocean in which the test would occur and the short duration of the test, and since no permanent residents (low-income, minority, disadvantaged, or other) reside in the project area, the potential to disproportionately affect human health or the environment in low-income, minority or disadvantaged populations (including children) would not occur.

Table 4. Impact Summary Matrix (Page 3 of 3)

Resource	Plasma Sound Source Ocean Test/Southern California
Noise	**Proposed Plasma Sound Source Ocean Test Location** Air environment: Project-related noise associated with the operation of two marine vessels and the moored barge would not significantly change ambient noise conditions in the area. Underwater: Underwater noise produced by the surface vessels would be similar to noise produced by other vessels (e.g., depth sounders, fish finders) employed on other ships and boats operating in the area and would not significantly change underwater ambient noise conditions of the area.
Cultural Resources	**Proposed Plasma Sound Source Ocean Test Location** No known underwater archaeological resources would be impacted as a result of the Plasma Sound Source ocean tests within the proposed ocean test location.
Safety and Environmental Health	**Proposed Plasma Sound Source Ocean Test Location** During vessel operations, deployment activities, and retrieval operations, standard vessel operating safety procedures would be implemented to protect public non-participants and military personnel. In addition, retrieval of all test components would be achieved upon conclusion of the test. Therefore, given standard component retrieval procedures, impacts to public safety would not be significant. Exclusion areas associated with active acoustic testing of would be established as part of the proposed ocean test. In addition, the Navy would ensure no divers or dive flags are operating in the vicinity of the test vessel.

PART II: CONSISTENCY WITH PROVISIONS OF CALIFORNIA COASTAL ACT (PUBLIC RESOURCES CODE DIVISION 20)

The Navy has determined that a consistency determination is not required because a thorough analysis establishes that there would be no effects upon the coastal zone. This test is proposed to occur in an area offshore of the region at MCB Camp Pendleton that is routinely used for amphibious assault and mine warfare exercises. The test poses no threat to coastal resources. This Coastal Consistency Negative Determination (CCND) has been prepared in the format of a Coastal Consistency Determination (CCD) to highlight consistency with the applicable sections of the California Coastal Act of 1976 listed below. This was done since there was originally some uncertainty as to whether a CCND or a CCD should be prepared for the proposed Plasma Sound Source Ocean Test.

Sections of the California Coastal Act of 1976 applicable to this project, as determined by the Navy, include Article 2 – Public Access (Sections 30210-30214); Article 3 – Recreation (Sections 30220-30224); Article 4 – Marine Environment (Sections 30230-30237); Article 5 – Land Resources (Section 30240-30244) and Article 6 – Development (Sections 30250-30255).

Article 1 – GENERAL (Sections 30200):

Section 30200

The proposed project complies to the maximum extent practicable with the goals of the state in protecting the coastal zone, and careful consideration has been given to these goals in reviewing the impacts associated with the proposed test.

Article 2 – PUBLIC ACCESS (Sections 30210-30214):

Section 30210

Under the proposed action, all test activities would be conducted in waters approximately four nautical miles offshore of Marine Corps Base Camp Pendleton, outside of the California Coastal Zone. To avoid conflicting uses of the area, a Notice to Mariners (NOTMAR) would be issued 48 hours before commencement of the test to give regular boat traffic ample notice prior to testing in the area. The proposed action would not interfere with recreational access to any public shoreline. Similarly, use of the proposed test area would not result in unnecessary hardships for commercial fishing operations. Therefore, no interference with public access to coastal resources would result from the implementation of the proposed Plasma Sound Source Ocean Test.

Section 30211

The proposed action would not interfere with the public’s right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.

Section 30212

An analysis was not provided for this section because the proposed action does not involve the shoreline.

Section 30212.5

An analysis was not provided for this section because the proposed action is not a public facility.

Section 30213

An analysis was not provided for this section because the proposed action does not provide lower-cost visitor and recreational facilities.

Section 30214

The proposed action considered public access policies to provide the maximum public access possible. See response to Section 30210 above for description of potential limitations to public access.

Article 3 – RECREATION (Sections 30220-30224):

Section 30220

Under the proposed action, recreational opportunities within the shoreline area would not be affected. Recreational uses of offshore coastal waters would not be affected. To avoid conflicting uses of the area, a Notice to Mariners (NOTMAR) would be issued 48 hours before commencement of the test to give regular boat traffic ample notice prior to testing in the area.

Section 30221

No oceanfront land suitable for recreational use is proposed for development under the proposed action.

Section 30222

No private land suitable for visitor-serving commercial recreational facilities is proposed for development under the proposed action. No private lands would be affected under implementation of the proposed action; therefore, impacts to private land suitable for visitor-serving commercial recreational uses would not occur.

Section 30222.5

No oceanfront land suitable for coastal-dependent aquaculture is proposed for development under the proposed action. Therefore, impacts to oceanfront land suitable for coastal-dependent aquaculture would not occur.

Section 30223

No upland areas necessary to support coastal recreational uses are proposed for development under the proposed action. Therefore, impacts to upland areas necessary to support coastal recreational uses would not occur.

Section 30224

No oceanfront land suitable for recreational boating use is proposed for development under the proposed action. Therefore, impacts to oceanfront land suitable for recreational boating use would not occur.

Article 4 – MARINE ENVIRONMENT (Sections 30230-30237):

Section 30230

Although the proposed ocean test would potentially affect the marine environment, impacts would not be significant and biological productivity of coastal waters would be maintained. Potential impacts to various

aspects of the marine environment, including specific marine resources (i.e. water quality, marine biology, marine mammals and threatened and endangered species) are discussed below. The primary issue in this section is possibility of effects on marine mammals. A detailed analysis of that issue is included below and demonstrates that the test will not cause significant effects on marine mammals.

1.1 Marine Environment

1.1.1 Approach to Analysis

For the Plasma Sound Source ocean test, potential impacts would be limited to water quality and marine sediment issues due to the metals contained in individual test components. Determination of significant impacts on marine water quality is based upon criteria in the *Water Quality Control Plan for Ocean Waters of California* (The Ocean Plan) established by the SWRCB (SWRCB and California EPA 1997) and the *USEPA National Ambient Water Quality Criteria* (USEPA 1986). All Plasma Sound Source components would be removed upon completion of testing. Therefore, the proposed Plasma Sound Source ocean test would not have a significant impact on water quality.

1.1.2 Plasma Sound Source Ocean Test Location

1.1.2.1 Proposed Plasma Sound Source Ocean Test Location

Area outside California Coastal Zone Waters

Water Quality

Under the proposed Plasma Sound Source ocean tests, there would be no physical discharges to the marine environment in waters outside of the California Coastal Zone (CCZ), which is defined as extending from shore to a distance of 3 nm (5.6 km) from the shore. All component surfaces of the MIUW R&D passive LBA array and the Plasma Sound Source impulsive system with the potential to corrode are encapsulated in a chemically inert polyurethane (rubber-like) boot, coating, or secondary housing. This encapsulation would prevent all potentially corrodible metals from contacting the environment. Alkaline batteries will be used in the ocean test in the passive receive array; however, there would be no exposure of inner battery constituents to seawater and no discharges to the marine environment due to the encapsulation. In addition, the MIUW R&D passive LBA array used in support of the Plasma Sound Source test would be removed upon completion of the test.

Marine Sediments

Passive receive array components have been designed to minimize drag, limiting sediment disturbance. Since the array and its associated cable to be deployed in the water would only be 3.8 cm (1.5 inches) and 0.38 cm (0.15 inches) (respectively) in diameter, sediment disturbance would be minor. In addition, increases in turbidity would be minimal.

Three anchors would be employed to stabilize the source platform. It is estimated that 200 m^2 /anchor would be momentarily disturbed during deployment and retrieval (600 m^2 total). Any sediment disturbance that would occur would be short-term and not significant. For these reasons, the proposed Plasma Sound Source ocean test would not have a significant impact on marine sediments.

Area within California Coastal Zone Waters

Impacts within CCZ waters would not occur, since all Plasma Sound Source test components would be located outside of CCZ waters.

1.2 MARINE BIOLOGY

1.2.1 Approach to Analysis

Marine biology issues related to the Plasma Sound Source ocean test are associated with potential impacts to sensitive habitats or species from the deployment of underwater components in the marine environment. Sensitive habitats or species are those that are demonstrably rare. Threatened or endangered species are protected by federal or state statutes or regulations, or have recognized commercial, recreational, or scientific importance. (Impacts on marine mammals are discussed in Section 1.3.)

Potential impacts to sensitive marine flora associated with the proposed project would come from the cable resting on the seafloor. In areas where a kelp bed exists, the deployment vessel moving through the surface canopy may result in removal of the upper 1.5 m (5 ft) of the canopy or the cable may fall on subsurface kelp resulting in either cutting the plant or dragging it to the bottom. The cable by landing directly on top of it may affect Benthic marine flora.

Since there are no chemical discharges associated with Plasma Sound Source, only physical impacts on marine biological resources are analyzed. In addition, impacts of underwater sound on fish populations are also addressed within this section due to the potential impacts on catchability.

1.2.2 Plasma Sound Source Ocean Test Locations

1.2.2.1 Proposed Plasma Sound Source Ocean Test Location

Area outside California Coastal Zone Waters

Marine Flora

The Plasma Sound Source ocean test would be short-term in duration and would not result in permanent alterations of marine plant composition or populations. Plasma Sound Source operational criteria require that the test location be free of kelp or dense mats of benthic algae.

Historic records indicate that kelp has not been present in the proposed ocean station test location. Other benthic marine flora may be present; however, given the small area affected by the cable and the opportunistic nature of marine plants, impacts would not be significant.

The diameter of the MIUW R&D passive LBA array and cabling is relatively small, ranging in size from 0.38 to 3.80 centimeters in diameter. In the case of the largest diameter cable, approximately 3 meters^2 of ocean floor would be in direct contact with the Plasma Sound Source ocean test components. In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed. The Plasma Sound Source array active component would be vertically suspended in the water column with no impact on the bottom sediment distribution.

Plasma Sound Source operational criteria require that the tests be located in a relatively smooth bottom area; therefore, the ocean tests would be sited in an area free of kelp or dense mats of benthic algae. Even if sparse vegetation were located in the region of direct influence, permanent alterations of marine plant composition or populations would not occur because of minimal contact of the cable with marine flora. Therefore, impacts to marine flora would not be significant.

Marine Fauna

The Plasma Sound Source ocean test would be short-term in duration and would not result in permanent alterations to marine fauna. The diameter of the MIUW R&D passive LBA array cables is relatively small ranging in size from 0.38 to 3.80 centimeters. Even in the case of the largest diameter cable, only 3 meters^2 of ocean floor would be in direct contact with the Plasma Sound Source ocean test components. In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed.

Potential impacts on nektonic marine animals (e.g., fish, squid, etc.) would be limited to the momentary disturbance associated with Plasma Sound Source source and MIUW passive array components traveling through the water column and/or reaching the sea floor. Impacts would not be significant since these organisms are highly mobile. Sessile biological assemblages (e.g., infauna and epifauna) directly in contact with Plasma Sound Source ocean test components could be minimally affected due to the minor disruption of the sediment in contact with the MIUW passive array components. Most benthic species have hard outer coverings (e.g., mollusks have shells, crustaceans have exoskeletons), and many benthos have the ability to live buried in the sand (e.g., worms, echinoderms). Consequently, survival would be likely even if a MIUW passive array component were placed directly on a benthic organism. This would not be considered a potential lethal effect, as movement away from the component would be probable. Therefore, impact to marine fauna would not be significant. Furthermore, since no discharges of chemicals would be released into the water column or sediments, no accumulation of chemicals in marine organisms would occur.

Sensitive ocean bottom marine resources in the open ocean are generally scarce since soft bottom habitats typically have low species diversity in relation to hard-bottom or near-shore habitats. Species densities also decrease in relation to depth; therefore, the area outside California Coastal Zone waters would have fewer species. Physical impacts to marine biological resources in the area outside CCZ waters would not be significant.

Impacts of Underwater Sound on Fish and Fisheries

A potential issue related to the proposed tests is that production of underwater noise could affect the behavior of fish in such a way that their catchability is reduced.

Fish can hear underwater sounds and often react to them. Impacts on fish and the distances at which these behavioral impacts can occur depend on the nature of the sound, the hearing ability of the fish, and species-specific behavioral responses. Changes in fish behavior can, at times, reduce their catchability. Table 5 below summarizes the ability of fish to hear sounds and the reactions of fish to those sounds. This information is then used to predict the likely impacts of the proposed Plasma Sound Source ocean test on fish and fisheries.

Table 5. Hearing Thresholds (in dB re 1 m Pa) for Various Species of Fish

Species	Hearing at Highest Measured Frequency	Hearing Threshold at Frequency of Best Hearing
Cod	119 dB @ 400 Hz	95 dB @ 283 Hz
Cod	110 dB @ 470 Hz	75 dB @ 160 Hz
Cod	140 dB @ 600 Hz	65 dB @ 150 Hz
Pollack	107 dB @ 470 Hz	81 dB @ 60-160 Hz
Plaice	126 dB @ 200 Hz	97 dB @ 110 Hz

Atlantic Salmon	132 dB @ 380 Hz	96 dB @ 160 Hz
Yellowfin Tuna	120 dB @ 1,000 Hz	89 dB @ 500 Hz

Source: Fay 1988.

During underwater sound source operations, the impulsive sound source would be moored due to testing requirements. Because the transmissions would be attenuated, fish would be exposed to acoustic source levels for only a short period of time. If there were a change in fish behavior, it would be of short duration and would not affect catchability. Given the moderate energy level in each pulse at the Plasma Sound Source array and short duration of possible exposure to maximum received levels, the projected sounds would not have deleterious or significant impacts on the hearing abilities of fish.

Threatened and Endangered Species

The Southern California ESU of west coast steelhead was recently listed as endangered and typically spends 2-3 years in marine waters. Although the Southern California ESU of west coast steelhead could potentially occur in the area, impacts would not be significant since steelhead are a highly dispersed, solitary species when they inhabit the open ocean. Although four federally listed species of sea turtles could potentially occur in the area, preliminary investigations indicate that hearing sensitivity is limited to low frequency bandwidths (60-1,000 Hz) (Ridgway et al. 1969). Sea turtle hearing threshold at 70 Hz has been estimated at 132 dB. There are no acoustic disturbance or temporary threshold data available. However, the 70 Hz hearing threshold is roughly comparable to that measured for small odontocetes and higher than that for pinnipeds (Richardson, 1995). Similarly, the hearing threshold for sea turtles appears to be significantly higher than that for fish found in the area. It is therefore likely that disturbance reactions in sea turtles will be lower than for fish or for small odontocetes (Section 1.3.2). Due to the limited duration of the acoustic signals (about 2.5 milliseconds) and the low duty cycle (minimum time between pulses is 15 seconds), masking effects are not expected to be significant. Due to the low potential of encountering any of the federally protected sea turtles, and the short-term nature of the proposed tests, no significant impacts would occur. Based on this determination, there would be no impact on federally protected marine species (Marine mammals are addressed in Section 1.3).

Area within California Coastal Zone Waters

Impacts to the marine environment inside CCZ waters would not occur because that zone of influence described for the Plasma Sound Source test is outside of CCZ waters. Therefore, impacts to marine flora and fauna in the CCZ would not be significant.

1.3 MARINE MAMMALS

1.3.1 Approach to Analysis

Issues of concern to marine mammals analyzed in this Coastal Consistency Negative Determination include the potential for (1) changes in behavior due to impacts of underwater noise associated with the tests, (2) attraction/ingestion/entanglement/collisions, and (3) chemical contamination. Of these, most attention is devoted to acoustic issues (Section 1.3.2) because marine mammals rely on hearing for feeding and communication. The main noise-producing aspects of the proposed tests are the active acoustic source operations.

In order to determine the ranges at which marine mammals may potentially be affected by man-made sources of sound, three factors must be considered: the acoustical characteristics of the source, the propagation of sound through the ocean environment and the effects of received sound on marine mammals.

The first two factors are comparatively well understood. The acoustical characteristics of the Plasma Sound Source sound source were determined by laboratory measurement. The propagation of sound in the ocean environment was predicted by means of a simple calculation and also by use of a Navy computer program that mathematically models the acoustical characteristics of the ocean and sea floor by means of a range dependent parabolic equation.

The third factor, the effects of received sound on the animal, is the least understood and has been the subject of considerable controversy. The subject of marine mammal reactions to noise is a rapidly evolving field of science. Every effort has been made to use the best available peer reviewed data in conducting the analyses used to prepare this Coastal Consistency Negative Determination.

Underwater sounds would be emitted either incidentally or intentionally during the proposed ocean tests. These include sounds incidental to vessel operations as well as those emitted intentionally to test the Plasma Sound Source equipment. The following analysis addresses whether these sounds have the potential for:

- interference with (mask) the detection of marine mammal calls, or other natural sounds important to marine mammals;
- causing biologically significant disturbance reactions; or
- causing hearing damage or physical injury to marine mammals.

To address these questions, this section briefly presents background on acoustic masking, acoustic disturbance, and the potential for hearing damage. Predictions about the potential acoustic impacts of the major noise-producing elements of the proposed tests on marine mammals are included. Considerations specific to the proposed test are identified where appropriate.

The potential impacts of test activities are analyzed for three groups of marine mammals: mysticetes (baleen whales), odontocetes (toothed whales, dolphins and porpoises), and pinnipeds (seals and sea lions). Activities associated with the proposed ocean test would have essentially no impact on sea otters, given their extremely low numbers in the proposed test area, their restricted/coastal distribution in both the proposed and alternative test area, and their habit of resting (rafting) at the surface with their ears above the water roughly 50 percent of the time. Available data on marine mammal hearing and behavioral reactions are limited to a few species, particularly when attention is restricted to low-frequency sounds (Richardson et al. 1995; Au et al. 1997; Kastak and Schusterman 1998). Accordingly, generalizations about certain species groups are based on test results on related species. For example, studies on the hearing range and behavioral reactions of bottlenose dolphins and a few other small toothed whales (i.e., Risso's dolphin, false killer whale) can be used to draw tentative conclusions about potential reactions of other types of small- and moderate-sized odontocetes that have not been studied. Similarly, audiograms and behavioral responses of California sea lions and harbor seals are referenced to infer likely pinniped responses to test activities.

Both methods of calculating the acoustic propagation from the Plasma Sound Source source indicate that, at worst, the received energy levels will fall below 175 dB re 1 m Pa^2-sec (energy) at less than 0.2 km from the Plasma Sound Source active acoustic source.

In addition to acoustic issues, the potential for marine mammal entanglement, ingestion, and chemical contamination are addressed in Sections 1.3.3 and 1.3.4, respectively. Entanglement and ingestion are potential concerns because of the lengths of cable (up to 3 km) and associated equipment to be deployed during the tests. Risk of entanglement, ingestion, and chemical contamination are mitigated by removal of all equipment and cable within two weeks of the test completion. Collisions with vessels and underwater gear are also briefly addressed.

The potential for a marine mammal "take," in accordance with the Marine Mammal Protection Act (MMPA) (16 USC 1361 *et seq.)* is addressed in Section 1.3.5, with emphasis given to species listed as threatened or

endangered. The term "take" is statutorily defined in the MMPA to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Under the 1994 MMPA amendments, Congress statutorily defined and divided the term "harassment" to mean "any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding or sheltering (Level B Harassment)."

1.3.2 Acoustic Sources

An impulsive acoustic source array would be used during the proposed test to evaluate system performance. A maximum of 56 hours of active acoustic testing, occurring only during daylight hours, would occur over eight days occurring between mid-August and 30 September 1999.

Potential Impacts from the Moored Source

The Plasma Sound Source impulsive source would be deployed to a mid water position from a moored barge to test the detection and tracking capabilities of a receiving hydrophone array. The source depth would be approximately 80 m (262 feet). The maximum energy source level for impulsive sounds will be 219 dB re 1 m Pa^2-sec with a spectrum level of 190 dB re 1 m Pa^2/Ö Hz/m in the 300 to 650 Hz band. Odontocetes and pinnipeds have relatively poor hearing at frequencies below 1 kHz, requiring levels near 80-100 dB re 1 m Pa for signal detection. Conversely, mysticete ear structure indicates good hearing at these relatively low frequencies (Ketten 1994). Thus, mysticetes are the marine mammals having the greatest potential to be affected by signals from the moored source.

The available information on harassment of marine mammals in the presence of man-made noise is limited as to species, geographical area and type of noise source studied and has for the most part been derived from opportunistic studies. This Coastal Consistency Negative Determination uses the impulsive sound criterion of 180 dB re 1 m Pa^2-sec for harassment from single acoustic pulses (Final Environmental Impact Statement (FEIS) Shock Testing the SEAWOLF Submarine, May 1998, Department of the Navy) and reduces that criterion to 175 dB re 1 m Pa^2-sec for multiple pulses.

A single received level (175 dB re 1 m Pa^2-sec) has been used to define a radius for a harassment zone for mysticetes to pulsed noise. Both a simple spherical spreading loss (20 log r) model and a more sophisticated range dependent parabolic equation acoustic propagation model have been used for these calculations and found to agree that the 219 dB re 1 m Pa^2-sec impulsive source spectrum level will produce received levels of less than 180 dB re 1 m Pa^2-sec for a single pulse event at a range from the acoustic source of 0.09 km and for multi-pulsed events to 175 dB re 1 m Pa^2-sec at 0.16 km from the source. Given this, the potential maximum harassment area for the short duration multi-pulsed impulsive sound source involved in this test is 0.08 km^2. Similar "proxy" received levels have not been established for odontocetes nor pinnipeds (NRC 1994) but, as mentioned above, these groups all have comparatively poor hearing at frequencies below 1 kHz, so the acoustic harassment zone would be smaller than that for mysticetes.

When the Plasma Sound Source source is operating at its loudest level (i.e. 219 dB re 1 m Pa^2-sec), the potential acoustic harassment zone as defined by the 175 dB contour extends 0.16 km from the source (Figure 4). During these periods, at least two qualified observer personnel will stand dedicated watch for marine mammals to detect any animals that might approach the moored source (refer to Section 1.3.2.5). If animals approach within 0.2 km of the ship, the sound transmission would be stopped. In addition, operations would be suspended if reduced visibility (i.e. fog) prevented the marine mammal observers from seeing a minimum of 0.2 km, 25% farther than the maximum range for potential acoustic harassment in the multi-pulse event (approximately 0.16 km). The 25% greater range was selected in order to allow for a margin of error in the ability of the visual monitors to determine where 0.16 km was in relation to the source. Table 6 shows the expected numbers of

marine mammals that might be expected to pass within the Plasma Sound Source system's potential harassment zone based upon species density data derived from Barlow, et al. (1995). As shown, the maximum expected exposure is for common dolphins, with a average value of 0.024 animals that might be expected within the Plasma Sound Source harassment area. It must be noted that these data represent wide area averages for the expected density of marine mammals.

The actual number of animals most likely to be encountered at any given time and place is zero. When animals are present, their numbers in the area may range from one individual up to the low hundreds for some species of odontocetes, including those most likely to be encountered in the test area, small odontocetes such as common dolphins. The large average group size for these species makes it very unlikely that they would be overlooked by the marine mammal observers if the animals should approach within 0.2 km of the acoustic source.

A coastal species of concern, the gray whale, migrates through the Southern California Bight in the winter and spring. Gray whales are not ordinarily found in the SCB in summer and there is very little possibility of a gray whale approaching the Plasma Sound Source array during the sea test.

The very small size of the Plasma Sound Source test harassment area (0.08 km^2), in combination with onsite visual monitoring as mitigation in the migration area, would result in no significant biological impacts of the deployed sound source to marine mammals.

1.3.2.1 Masking Effects

Masking is a natural phenomenon whereby a sound source becomes inaudible when increased background noise reduces the distance over which a listener can detect calls or other sounds of interest. The following subsections provide specific assessments of the potential for masking by vessel operations and by the moored sound source operations during the proposed Plasma Sound Source ocean test.

Table 6. Estimates of Marine Mammals within Acoustic Harassment Area for Summer & Fall

Common Name	Scientific Name	Stock	Status[1]	Animal Density, km^{-2}	Average No. within Plasma Sound Source Area
Mysticetes					
Gray whale	*Eschrichtius robustus*	East. N. Pacific	NL	NA	0
Blue whale	*Balaenoptera musculus*	CA	E	0.0028	0.00026
Fin whale	*Balaenoptera physalus*	CA	E	0.0011	0.000088
Minke whale	*Balaenoptera acutorostrata*	CA	NL	0.0006	0.000048
Humpback whale	*Megaptera novaeangliae*	CA	E	0.0008	0.000064
Bryde's whale	*Balaenoptera edeni*	CA (1991/93)	NL	0.000029	0.0000024
Sei whale	*Balaenoptera borealis*	CA (I 991/93)	E	0.000044	0.0000035
Northern right whale	*Eubalaena glacialis*	N. Pacific	E	NA	0

Odontocetes					
Sperm whale	*Physeter macrocephalus*	CA	E	0.0009	0.000072
Pygmy (or dwarf) sperm whale	*Kogia breviceps*	CA (1991/93)	NL	0.0058	0.00047
Killer whale	*Orcinus orca*	CA	NL	0.0004	0.000032
Baird's beaked whale	*Berardius bairdii*	CA	NL	0.00047	0.000037
Cuvier's beaked whale	*Ziphius cavirostris*	CA	NL	0.0072	0.00058
Beaked whales spp.	*Mesoplodon spp*	CA(1991/93)	NL	0.0039	0.00031
Risso's dolphin	*Grampus griseus*	CA	NL	0.0104	0.00084
Short-finned pilot whale	*Globicephala macrorhynchus*	CA(1991/93)	NL	0.0012	0.000099
Northern right whale dolphin	*Lissodelphis borealis*	CA	NL	0.0115	0.00092
Long-beaked common dolphin	*Delphinus capensis*	CA	NL	0.040	0.0032
Short-beaked common dolphin	*Delphinus delphis*	CA	NL	0.3013	0.024
Striped dolphin	*Stenella coeruleoalba*	CA	NL	0.025	0.0020
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	CA	NL	0.0151	0.0012
Bottlenose dolphin	*Tursiops truncatus*	CA	NL	0.0018	0.00014
Pinnipeds					
Dall's porpoise	*Phocoenoides dalli*	CA	NL	0.0962	0.0077
California Sea Lion	*Zalophus c. californianus*	U.S.	NL	0.19	0.016
Harbor Seal	*Phoca vitulina*	CA	NL	0.06	0.0044
[1]Status: E = Endangered		NA = Not Found in Area in this Season			
T = Threatened					
NL = Not Listed					

Masking by Vessel Operations

The two vessels to be used during the proposed Plasma Sound Source ocean test would be of moderate size and power as compared with the many other vessels that operate in the vicinity of the test area. Due to the Plasma Sound Source ocean test operational requirements, project vessels would operate mainly at low speeds, thus reducing noise

emissions and any possibility of collision with marine mammals. Vessels would operate, as required, a maximum 22 days (with 56 hours of active acoustic testing), during the test period. Vessel noise would occur primarily at low frequencies (i.e., less than 1 kHz), that would overlap the dominant components of mysticete, but not odontocete, calls (Richardson et al. 1995). Most communication, and all echolocation, calls of odontocetes are at frequencies well above those associated with vessel noise. In addition, audiograms and ear structure indicate that most odontocetes have poor hearing at frequencies below about 1 kHz (Ketten 1994). Specifically, recent studies have determined that the hearing threshold was roughly 140 dB for a pure-tone signal at 75 Hz for a false killer whale and a Risso's dolphin (Au et al. 1997). Thus, environmental sounds important to most toothed whales are presumably also at frequencies higher than those of the strong components of vessel noise. Therefore, vessel operations would not have significant masking effects for odontocetes.

Vessel noise would overlap frequencies of mysticete calls. This could result in some temporary reduction in the radius around a calling whale within which its calls could be heard by another animal. However, characteristics of whale calls, and variability in calling behavior, would likely mediate any potential problem. For example, blue and fin whales produce most of their calls at about 20 Hz, frequencies below those commonly associated with propeller cavitation tones (40-50 Hz), the dominant spectrographic feature of vessel noise. Humpback whales produce complex sounds across a wide frequency band, such that tonal peaks of vessel noise would not likely mask their calls. Gray whales appear to call infrequently and, in breeding lagoons have been shown to modify their calls with changes in the ambient noise environment (Dahlheim et al. 1984). Overall, with respect to planned test activities, vessel noise will not have any significant biological consequences for mysticetes for the following reasons:

- The noise associated with project vessels would be a negligible increment to the total vessel noise that is encountered by any whales occupying the test areas.
- The vessel sounds would be comparatively weak (e.g., less than 175 dB re 1 m Pa @ 1m) because of the typical slow speed of the vessels during the proposed Plasma Sound Source ocean test.
- The duration of vessel operations in any one area would be relatively brief given the need to move to different locations to accommodate various test activities.

Masking by vessel noise does not seem to be a significant problem for pinnipeds, given their frequent proximity and lack of response to vessels of a variety of classes (Richardson et al. 1995). There is some overlap between the frequencies important to pinnipeds and the underwater noise emitted by moderate-sized vessels. However, the predominant frequencies of most pinniped calls, and the frequency range of best auditory sensitivity described for pinnipeds, are higher than the dominant frequencies of underwater sound from moderate-sized vessels. Therefore, as for odontocetes, vessel activities associated with the proposed Plasma Sound Source ocean test would not present significant masking effects for pinnipeds.

Masking by the Moored Sound Source

It is unlikely that signals associated with the impulsive moored source would mask acoustic signals important to whales (odontocetes and mysticetes). During impulsive sound transmissions signals would consist of a 2.5 millisecond signal separated by a minimum of 15 seconds with minutes to days between signals. Sounds important to whales would be detectable during the 15-second "gaps." Given these factors, masking effects of the projected sounds on mysticetes or odontocetes would be negligible and, therefore, not significant.

Similarly, signals emitted by the moored source would not pose a significant masking problem for pinnipeds given that:

- boat sounds do not seem to be a problem for pinnipeds;
- during impulsive sound emissions, pinnipeds would be able to detect other signals between pulses;
- projected sounds would be strong for limited periods.

Summary of Potential Masking Effects

In summary, moored sound source and, to a lesser degree, vessel operations may cause some minor masking of sounds relevant to mysticetes. Given the limited area of potential impact, the low likelihood of encountering marine mammals during test operations, and the negligible consequences resulting from potential masking during the Plasma Sound Source ocean test, impacts would not be significant, and would not constitute a take by harassment as defined by the MMPA.

1.3.2.2 Disturbance Impacts

As described elsewhere, the proposed tests would include vessel operations and sequences of impulsive sounds to test the Plasma Sound Source receiving equipment. For each major group of marine mammals in the region, this section:

- summarizes what is known about the responses to these types of sounds, based primarily on the review of Richardson et al. (1995); and
- evaluates the expected disturbance impacts of each of these types of sound as they would occur during the proposed Plasma Sound Source ocean test.

Disturbance to Mysticetes (Baleen Whales)

As previously discussed, reaction thresholds of mysticetes to anthropogenic sounds are usually well above the assumed threshold for detection than for other families of marine mammals. However, reaction thresholds vary widely depending on the type of noise and other circumstances. Reaction thresholds can be low for "threatening" or variable sounds (e.g., an approaching boat with received noise level less than 100 dB re 1 m Pa), higher for continuous sounds (e.g., industrial noise with received levels near 120 dB re 1 m Pa), and much higher for regularly repeated, short impulsive signals (e.g., seismic exploration. In all situations, there may be considerable variation in responses among individual whales.

Vessel Operations

Mysticetes show variable reactions to boats, ranging from approach to indifference to active avoidance (Richardson et al. 1995; Richardson and Wursig 1997). In general, baleen whales usually tolerate and may even approach idling or slowly moving vessels, especially when the vessels do not head toward the whales, nor change course, speed, or propeller setting. In these cases, whales generally do not react conspicuously at distances exceeding about 300 m (980 ft), and often tolerate closer approaches. In contrast, whales often interrupt their prior activities and dive or swim rapidly away from vessels that are approaching directly at high speed or maneuvering nearby. In these latter cases, reaction distances can range up to several kilometers, and the received sound levels eliciting the reactions can sometimes be quite low (e.g., less than 100 dB re 1 m Pa). However, even the reactions to direct vessel approaches are short-term in nature. The best example of this is the continued occupancy by mysticetes of busy shipping lanes and fishing grounds in many parts of the world.

The two vessels that would be used during the proposed ocean tests are of moderate size and power as compared with the many other vessels that operate in the vicinity of the test areas. Project vessels would operate mainly at low speeds within a specific test area, thus reducing noise emissions and disturbance impacts. Project vessels would not purposefully approach baleen whales, and it is unlikely that a baleen whale would approach the vessels.

Moored Sound Source

In the course of the preparation of the SEAWOLF FEIS, a criterion for acoustic harassment of 182 dB re 1 m Pa^2-sec was developed; that analysis has been used as a standard in the preparation of this Coastal Consistency

Negative Determination, though the Plasma Sound Source range calculations were done with criteria of 180 dB re 1 m Pa^2-sec for single pulses and 175 dB re 1 m Pa^2-sec for multiple pulses.

Predicted disturbance impacts on mysticetes would be negligible, with no significant consequences to the animals. The range of potential impacts addressed above would not constitute a take by harassment as defined by the MMPA.

Disturbance to Odontocetes (Toothed Whales)

As for mysticetes, odontocete reaction thresholds are generally well above detection thresholds in instances where responses to anthropogenic noise have been described. Reactions can be quite variable, from attraction to active avoidance of noise sources. Examples germane to the proposed Plasma Sound Source ocean test are provided below.

Vessel Operations

Small- and moderate-sized odontocetes inhabiting littoral waters may show either attraction to or avoidance of boats, depending on species and circumstances. Many species of dolphins and some porpoises (e.g., Dall's porpoise) often approach vessels and ride their bow waves. At other times the same species show at least minor avoidance reactions to vessels, especially if they associate the vessel with harassment (Au and Perryman 1982). Harbor porpoises tend to move away from approaching boats (Polacheck and Thorpe 1990). Killer whales and various dolphin species, although often seen from boats, sometimes exhibit subtle tendencies to avoid approaching vessels (Richardson and Wursig 1997). Although some odontocetes have been reported to show strong avoidance of vessels at ranges up to a few kilometers, these were special cases that usually involved animals that had previously been chased or otherwise harassed by boats. With the probable exception of boats that purposefully approach toothed whales, there is no evidence that routine operations by small and moderate-sized boats cause deleterious disturbance impacts to odontocetes in littoral waters (Richardson et. al 1995).

The two vessels associated with the proposed Plasma Sound Source ocean test would operate mainly at low speeds due to test requirements, thus reducing noise emissions, disturbance impacts, and the likelihood that odontocetes would approach the vessels to bow-ride. Thus, vessel disturbance impacts on toothed whales during the proposed tests would result in negligible consequences to the animals and would be in line with other vehicle operations in the test area, and would not constitute a "take" by harassment as defined by the MMPA.

Moored Sound Source

Reactions of odontocetes to steady low-frequency anthropogenic noise have not been studied extensively. In one study, captive beluga whales showed very little reaction to playbacks of recorded low frequency drilling sounds even when received levels were as high as 153 dB re 1 m Pa (Thomas et al. 1990). During the Heard Island Feasibility Test, hourglass dolphins were commonly seen in waters where the level of the 57 Hz test sounds was near 160 dB re 1 m Pa (Bowles et al. 1994). There have been a few reports of free-ranging odontocetes that apparently showed localized avoidance of areas strongly ensonified by low frequency drilling or dredging sounds. However, responses and sound exposure levels were not well quantified, and in some cases there was considerable tolerance of strong continuous low frequency sounds (Richardson et al. 1995). In general, disturbance thresholds for odontocetes exposed to steady low-frequency sounds are poorly documented but seem high. This is probably related to the high hearing thresholds of most toothed whale at frequencies below 1 kHz.

Similarly, there are few reports of odontocete responses to impulsive low-frequency sound in littoral waters. Seismic operators occasionally see dolphins near airgun arrays where received sound levels must be quite high, and there is some evidence of localized avoidance of such arrays (Mate et al. 1994; Arnold 1996; Goold 1996). In general, odontocetes apparently are not strongly disturbed by low-frequency impulsive sounds, again

probably because of their high hearing thresholds at low frequencies. Overall, predicted disturbance impacts on toothed whales by the impulsive emissions from the moored source, are expected to be negligible with no significant consequences to odontocetes.

Disturbance to Pinnipeds (Seals and Sea Lions)

As with cetaceans, there are few quantified reports of pinniped responses to anthropogenic noise. Where information is available, it appears that pinniped reactions to noise are quite variable, ranging from tolerance to flight, as summarized below.

Vessel Operations

Although the reactions of pinnipeds hauled out on land (or ice) to nearby boats have often been described, there is very little information about reactions of seals and sea lions in the water to approaching vessels (Richardson et al. 1995). Sea lions in the water often tolerate close and frequent approaches by vessels, and often congregate around fishing boats. Other species of pinnipeds have been sighted in proximity to both commercial and recreational vessels. Indeed, Kastak and Schusterman (1998) conclude that low frequency thresholds obtained from California sea lions suggest that this species is "relatively insensitive to the frequencies associated with most types of anthropogenic sound in the ocean." Thresholds for harbor seals were about 20 dB more sensitive at 100 Hz, indicating that phocids have more sensitive amphibious hearing than otariids (Kastak and Schusterman 1998). Northern elephant seals had the best amphibious hearing of the three species tested, suggesting this species would likely hear vessel operations associated with Plasma Sound Source ocean test in the proposed test area. However, the operating area would be sufficiently distant from pinniped haul-out beaches that impacts from such "hearing" are unlikely. Overall, because vessels associated with the Plasma Sound Source ocean test are of moderate size and would move at slow speeds, noise associated with vessel operations would not be expected to have a significant impact on pinnipeds in the water.

When hauled out, pinnipeds are more responsive but rarely react unless a boat approaches within 100-200 m (330-660 ft). Hauled out harbor seals sometimes become alert when a boat approaches within 150-300 m (495-990 ft), and may move into the water if the boat comes closer. Since the project vessels would not approach terrestrial haul-out sites, no such disturbance events would occur.

Moored Sound Source

Reactions of pinnipeds to continuous low frequency sounds have rarely been reported. However, ringed and bearded seals exposed to low-frequency drilling sounds at received levels as high as 130-140 dB re 1 m Pa showed little if any avoidance (Richardson et al. 1995). Although associated noise levels were not reported, sea lions were reported as "common" around oil production platforms offshore California and Alaska (Gales 1982). Harbor seals and California sea lions often tolerate high received levels (140+ dB re 1 m Pa) of higher-frequency sound (see next subsection), even though their hearing appears more sensitive at those frequencies.

Strong low frequency noise pulses used in attempts to scare pinnipeds away from fishing nets or fish ladders sometimes cause brief startle reactions, but habituation is rapid (Mate and Harvey 1987). Sound source levels of these devices commonly range from 185-195 dB re 1 m Pa-m. Sea lions in particular are very tolerant of strong noise pulses, especially when attracted to an area by prey (Richardson et al. 1995). Both phocids and otariids show considerable tolerance of the strong pulses from marine seismic exploration. Reactions are, at most, subtle and inconsistent even at distances as close as a few hundred meters, where received levels of the seismic pulses are on the order of 190 dB re 1 m Pa (Arnold 1996).

Because pinnipeds show tolerance, and often habituate, to strong low-frequency sound, the predicted disturbance impacts on pinnipeds from the moored sound sources during the proposed Plasma Sound Source ocean test would be insignificant and not constitute a "take" by harassment as defined by the MMPA.

Summary of Potential Disturbance Impacts

Emissions from the moored sound source may cause minor disturbance to some mysticete whales, but probably not to odontocetes or pinnipeds. Given the negligible consequences of minor disturbance, the limited area of potential impact, and the low likelihood of a marine mammal being present during the proposed tests, impacts are not expected to be significant and would not constitute a "take" by harassment as defined by the MMPA.

1.3.2.3 Hearing Damage

In humans and other terrestrial mammals, exposure to high levels of sound within the frequency range to which the auditory system is sensitive can lead to temporary reduction in sensitivity, termed Temporary Threshold Shift (TTS). If the noise exposure is sufficiently prolonged, or the level is sufficiently high, the noise can cause permanent hearing impairment, termed Permanent Threshold Shift (PTS).

There is little direct information about the levels of noise necessary to cause TTS or PTS in marine mammals. Recently, Ridgway et al. (1997) reported preliminary results of the first TTS experiments with bottlenose dolphins. After baseline masked-hearing thresholds were obtained, TTS was induced in each of four dolphins using high amplitude 1-second pure-tone-bursts at three discrete frequencies: 3 kHz, 20 kHz and 75 kHz. Temporary threshold shifts were observed above 194-201 dB at 3 kHz, 193-196 dB at 20 kHz, and 192-194 dB at 75 kHz. Of note, agitation by the dolphins was observed at levels above 186 dB at 3 kHz, 181 dB at 20 kHz, and 178 dB at 75 kHz (all dB re 1 m Pa). Ridgway et al. (1997) conducted the experiments specifically to address auditory criteria for three Navy sonars, and cite the need for additional research, including replication and testing across greater frequency ranges and with additional species. Overall, however, the preliminary results indicate that for bottlenose dolphins, TTS is lower at higher frequencies.

For pinnipeds, the only specific information on noise-induced TTS or PTS is for a harbor seal (Kastak and Schusterman 1996). This seal was intermittently exposed, over a 6-day period, to airborne noise from sandblasting. The received level was 90-105 dB re 20 m Pa overall, and 75-90 dB re 20 m Pa in the 1/2-octave band centered at 100 Hz (please note use of the in-air standard reference level of 20 m Pa versus the 1 m Pa reference used for underwater sounds). Immediately after this noise exposure, the seal's in-air hearing threshold at 100 Hz was increased by 8 dB above the pre-exposure thresholds (i.e. 72 versus 64 dB re 20 m Pa), and the seal had more difficulty in determining the presence or absence of the 100 Hz test tone. Complete recovery occurred by 1 week after the end of the noise exposure, indicating that hearing impairment was temporary, not permanent. Of note, TTS was evident at 100 Hz, even though the received level of sandblasting noise in the 1/2-octave band near 100 Hz was only about 10-25 dB above the normal hearing threshold at that frequency. Kastak and Schusterman (1996) speculate that the TTS at 100 Hz was related to higher received noise levels at lower or higher frequency bands.

The likelihood of TTS and PTS is briefly addressed in the following subsections, based on frequency-band and source levels of the Plasma Sound Source ocean test-related noise sources.

Vessel Operations and Moored Source

No TTS or PTS is expected for any marine mammal exposed to sounds from project vessels or sounds transmitted from the moored source. As described in previous sections, these sounds are all low frequency (less than or equal to 1 kHz) with maximum energy source levels at 174-219 dB re 1 m Pa^2-sec. In a recent study of TTS in bottlenose dolphins, some animals responded negatively to 3 kHz tonal sounds with received levels of 186 dB re 1 m Pa, but did not exhibit TTS until exposed to sound levels at 194 dB re 1 m Pa and higher (Ridgway, 1997). At their source, the sounds with frequencies below 1 kHz from the vessels are at least 20 dB below the TTS level, and 12 dB below agitation levels, suggesting there is no significant likelihood of TTS or agitation in odontocetes. Although few data are available for pinnipeds for TTS underwater, one might expect TTS in pinnipeds at somewhat lower received levels based on comparison audiograms depicting pinniped and

odontocete hearing at 1 kHz. Although otariid thresholds are only approximately 5 dB lower than odontocetes at 1 kHz, phocid thresholds are roughly 15-20 dB lower than those of odontocetes.

As discussed earlier, mysticetes are thought to have acute hearing at frequencies less than or equal to 1 kHz. Still, because TTS requires comparatively long-term exposure to noise, the likelihood of any TTS or PTS to mysticetes is remote. Rorquals, including blue, fin, Bryde's, and minke whales, are typically fast swimming animals (approximately 5-7 knots), humpbacks somewhat less so (approximately 4-5 knots), while northern right whales and gray whales are comparatively slow swimmers (approximately 2-5 knots). As mentioned earlier, the Plasma Sound Source operating area would be away from areas of concentration for these species, so no long-term exposures to vessel noise or moored source transmissions is anticipated. Even a very slow-swimming (2 kts or 3.7 km/hr) mysticete passing through the Plasma Sound Source operational area during transmission of the 219 dB re 1 m Pa^2-sec impulsive source would pass through the 160 m radial zone defining the 175 dB boundary in roughly 5 minutes. Note that the swimming speed used in this hypothetical example is roughly half that reported by Swartz and Jones (1987) for migrating whales. In addition, the dedicated watch, which will accompany transmission of the 219 dB re 1 m Pa^2-sec impulsive source, will serve to insure that mysticete whales are not exposed to loud sounds for periods long enough to cause TTS or PTS. Only daylight transmissions, with visibility of at least 0.2 km, will be allowed in order to permit visual observations. Overall, with visual mitigation during continuous transmission and short exposure times during pulsed transmissions, there is no significant possibility of TTS or PTS to mysticete whales during the Plasma Sound Source ocean test.

Summary of Potential for Hearing Damage

In summary, vessel and moored source operations would not cause PTS in any marine mammal, or cause TTS in any odontocete; TTS is extremely unlikely for phocids and mysticetes. It is likely that an

odontocete transiting the test area would be exposed to transducer operations at much lower "detection" levels and would have the opportunity to move away before being exposed to levels required for TTS. Therefore, impacts would not be significant and would not constitute a take by harassment as defined by the MMPA.

1.3.2.4 Summary of Potential Acoustic Impacts

Potential acoustic impacts of Plasma Sound Source ocean test operations on marine mammals vary with hearing capabilities of each major group (Table 7). For example, mysticete whales may hear noise from both the project vessels and the moored source. However, maximum source levels for the pulsed sources (219 dB re 1 m Pa^2-sec) are such that the area ensonified to levels above 175 dB is very small. Thus it is possible, but very unlikely, that the moored source noise would affect mysticete whales. It is unlikely that odontocetes or pinnipeds would be affected by either vessel or moored source noise due to comparatively poor hearing at frequencies less than or equal to 1 kHz. As stated at the outset, it is quite unlikely that any noise associated with Plasma Sound Source ocean test operations would be heard by sea otters due to their low numbers and exclusive occupation of coastal waters.

Table 7. Potential Impacts of the Plasma Sound Source Acoustic Source on Marine Mammals*

	Acoustic Source (dominant frequencies)	
Marine Mammal	**Vessels (< 1 kHz)**	**Moored Source (300-650 Hz)**

Mysticetes	Negligible	Unlikely
Odontocetes	Negligible	Negligible
Pinnipeds	Negligible	Negligible
Sea Otters	Negligible	Negligible

* Based on marine mammal hearing capabilities as summarized in Ketten (1992, 1994) for mysticetes, and in Richardson (1995) for odontocetes and pinnipeds.

Area outside California Coastal Zone

Acoustic impacts from the Plasma Sound Source ocean test are not predicted to result in a "take" by harassment of any marine mammal as defined by the MMPA (refer to Section 1.3.1). It is the interpretation of NMFS (1995, 1997) that minor changes in behavior do not constitute harassment under the MMPA. Furthermore, since the 1994 MMPA amendments were adopted, the NMFS has not expressed an interest in requiring take permits for vessels and associated acoustics, or for common vessel devices that employ active acoustics such as fish finders. Although the behavioral responses of marine mammals to low frequency anthropogenic noise have been the focus of recent study (e.g., Clark et al. 1988;Tyack 1998), there as yet are no firm conclusions as to specific noise levels that constitute "take" by harassment as defined by the MMPA. Based on the best-available data, it seems that potential marine mammal reaction to the noise-producing elements of the Plasma Sound Source test would be minimal. Therefore, no significant impacts to marine mammals would occur as a result of the proposed Plasma Sound Source ocean test, and all potential impacts would be expected to be below the threshold requiring incidental take authorization.

Area within California Coastal Zone Waters

The Plasma Sound Source acoustic source and the zone of potential acoustic harassment (radius = 0.16 kilometers) will be located outside of California Coastal Zone waters. Given the rapid attenuation of the energy level of the source to below 175 dB within 0.16 km of the source and the additional mitigation efforts implemented for the Plasma Sound Source test, no impacts on marine mammals are expected to occur.

1.3.2.5 Mitigation Measures for Acoustic Issues

The proposed Plasma Sound Source ocean test is not intrusive and has been designed to minimize environmental impacts, including potential impacts to marine mammals. Although acoustic impacts associated with the proposed tests would not be significant even without mitigation, the following mitigation measures would be adopted to ensure that the Plasma Sound Source ocean test would have negligible impacts on marine mammals (Table 8).

Table 8. Mitigation Measures for Marine Mammals during Plasma Sound Source Ocean test Acoustic Transmissions

Acoustic Source	**Watch Type***		**Operations Curtailed**
Pulsed**	**Visual**	**Dedicated**	
219 dB re 1 m Pa^2 –sec @ 1m	Ö	Ö	Mysticetes, pinnipeds, or odontocetes within 0.2 km

*A dedicated watch will begin 30 minutes before the start of any acoustic transmission and will continue for the duration of the transmission. Acoustic transmissions will be suspended if reduced visibility conditions (e.g. fog) prevents the marine mammal observers from seeing farther than the safety range for potential acoustic harassment (approximately 0.2 km).
** Acoustic transmission during daylight hours only.

For the proposed Plasma Sound Source ocean test a *dedicated watch* will be conducted by two personnel specifically trained in marine mammal identification who will have no other duties. A visual watch of waters within 0.2 km of Plasma Sound Source support vessels, by personnel whose primary duties involve safety of navigation, would be conducted at least 30 minutes before and continue during any impulsive sound source transmission.

These mitigation measures are not necessary to support the finding that impacts would be below the threshold of significance, and would be below the threshold of take by harassment as defined by the MMPA. There is no direct evidence that any marine mammal species would significantly modify their normal behavior in response to the localized, short-term impacts generated by implementation of the proposed ocean test operations. However, avoidance of overlap in the operating area, active sound transmissions during daylight hours only, visual monitoring, and delay of active acoustic operations have been integrated into Plasma Sound Source ocean test planning. They have been integrated because the procedures would not have an overall adverse impact on Plasma Sound Source ocean test activities and they provide additional assurance that there would be negligible impacts on marine mammals.

1.3.3 Attraction, Collision, Entanglement, and Ingestion Issues

It is possible that activities associated with the Plasma Sound Source ocean test could attract marine mammals, and lead to potential for collision, entanglement, or ingestion of test-related materials. Although this possibility is extremely remote, these factors are considered in the following subsections.

1.3.3.1 Attraction and Collisions

The primary attractants for marine mammals are other members of their own species, areas of prey concentration, and (in the case of toothed whales that bow-ride) moving boats. None of the activities associated with the proposed Plasma Sound Source ocean test would be expected to concentrate prey organisms for marine mammals, nor to make food more readily available to them. Project vessels might attract dolphins to bow ride. This could result in exposure of these animals to sounds transmitted by the moored source. Although this is unlikely due to slow vessel speeds required for test operations, sounds received by bow-riding dolphins would primarily be those from the ship.

Minke whales are sometimes attracted to stationary boats and may remain with them for hours (Richardson et al. 1995). This species occurs in both the proposed and alternative Plasma Sound Source ocean test area, but is not expected to linger within test areas.

On infrequent occasions, whales and ships collide, resulting in injury or death to the whale. Most reports of ship collisions with marine mammals have involved baleen and sperm whales, but bottlenose dolphins also have been struck (Richardson et al. 1995). Slow-moving species, especially the right whale and gray whale, are most likely to be struck by ships. For the past 3 years the U.S. Navy has required that its crews report all observed collisions with marine mammals. There have been no reports of collisions with marine mammals on the most extensively used portion of the SCB, Pt. Mugu Sea Range. In assessing the likelihood of collisions it is relevant to consider the following: baleen and sperm whales often try to avoid approaching vessels, the limited amount of Navy vessel traffic as compared with commercial vessel traffic, Navy vessels on the Sea Range or those associated with the proposed Plasma Sound Source ocean test do not operate at high speed, and the absence of reported collisions on the Sea Range. Given this, it is unlikely that a marine mammal would be injured or killed

by collision with a Navy vessel during any given year. Because of the rarity of the northern right whale (the species least able to avoid ships) in the SCB, the probability of a collision with this highly endangered species approaches zero. Although the possibility of a collision between a marine mammal and a Navy vessel conducting Plasma Sound Source ocean test cannot be absolutely excluded, the frequency of injury or death is very low and effects on marine mammals populations will not be significant.

Area outside California Coastal Zone Waters

As for acoustic impacts, the potential for marine mammal attraction to or collision with vessels associated with Plasma Sound Source ocean test is higher within CCZ waters of the mainland or island shore. As reviewed earlier, cetaceans and pinnipeds are generally more abundant closer to shore, so the likelihood of interaction is higher there. Overall, however, the two vessels associated with the Plasma Sound Source ocean test would not add significantly to the vessel traffic already common to both the proposed test areas.

Conversely, the potential for marine mammal attraction or collision in association with Plasma Sound Source ocean test is lower in waters farther from shore, because in general marine mammal relative abundance decreases with distance from shore. As reviewed in the preceding section, however, complex topography can belie this general rule of thumb because animal abundance is influenced by prey availability, which is usually enhanced over topographically complex regions (such as certain regions in the proposed test area). Visual mitigation, as described in Section 1.3.2.5 should further reduce any chance of attraction or collision with marine mammals.

Area within California Coastal Zone Waters

The potential for impacts due to marine mammal attraction or collision inside CCZ waters would be similar to that described for the area outside of CCZ waters while in transit to the test location.

1.3.3.2 Entanglement and Ingestion

Area outside California Coastal Zone Waters

Marine mammals sometimes ingest plastic bags and other small objects and commonly become entangled in fishing gear. However, the equipment planned for deployment during the proposed Plasma Sound Source ocean test does not have characteristics likely to cause entanglement. Even though laydown of cable for the passive MIUW LBA array is anticipated (< 3 km), all cable line is designed to rest on the seafloor. At any one location, the cable would consist of a single line extending more-or-less linearly along the bottom until rising to mate with the processing capability located on the moored barge. It is highly unlikely that any marine mammals would become entangled with this arrangement of cables. Most species do dive to or forage near the bottom, and any that do would not become entangled in a single cable. Situations where marine mammals do become entangled usually involve fishing gear or flotation lines, where the animals become ensnared in multiple lines or meshes. This situation would not occur in this project. Other gear associated with the test is too large to be ingested, and in any case does not have properties that would be attractive to marine mammals.

All in-water components would be removed within two weeks of the completion of the test. The equipment deployed during the Plasma Sound Source ocean test would not pose an entanglement nor ingestion risk to marine mammals. Therefore, the exposure of marine mammals to cables would be temporary and would not be significant.

Area within California Coastal Zone Waters

The potential to become entangled within Plasma Sound Source related gear should be non-existent as all equipment will be located outside of CCZ waters.

1.3.4 Chemical Contamination Issues

All Plasma Sound Source component surfaces with the potential to corrode are encapsulated in chemically inert polyurethane (rubber-like) boots, coatings, or secondary housings. This encapsulation would inhibit virtually all corrosion-related metals from contacting the environment. There would be no discharges to the surrounding marine environment. Thus, neither marine mammals, nor their prey, would be impacted by materials associated with the Plasma Sound Source ocean test.

1.3.5 Potential for Marine Mammal Take

Based on the analyses described in Sections 1.3.1 through 1.3.4, there would be no anticipated marine mammal take, as defined by the amended MMPA, associated with the proposed Plasma Sound Source ocean test operations. Overall, the likelihood that a marine mammal take would occur within the area ensonified at noise levels greater than 175 dB (energy) by the impulsive source are very small (0.16 km from the source), thereby making the likelihood of exposure of marine mammals to high received levels quite remote. In addition, mitigation measures would be implemented (refer to Section 1.3.2.5) so that the potential for affecting a marine mammal take is negligible.

The National Marine Fisheries Service has advised that the likelihood that a marine mammal will be taken (including harassed) by the test is low, and did not recommend application for an incidental harassment authorization. With the additional measure of a dedicated visual watch of two trained marine mammal observers during all active source operations, the test should not affect threatened or endangered species.

1.3.5.1 Threatened and Endangered Marine Mammals

Three mysticete species (blue, fin, and humpback whales) and one odontocete species (sperm whale) common to the proposed Plasma Sound Source ocean test location are federally listed as endangered. In addition, Guadalupe fur seals and sea otters are listed as threatened.

As stated above, based on analyses presented in the preceding sections, there would be no anticipated impact on federally listed threatened or endangered marine mammals posed by the proposed Plasma Sound Source ocean test. The proposed tests would be conducted well away from known areas where endangered mysticetes feed and aggregate. Thus, although a few individuals may hear sounds associated with Plasma Sound Source ocean testing, they are not likely to be affected by them.

Section 30231

Under the proposed action, the biological productivity and quality of coastal waters, streams, wetlands, estuaries and lakes would be maintained to ensure adequate populations of marine organisms and to protect human health. See response to Section 30230 above for a detailed description of potential impacts to the marine environment.

Section 30232

Under the proposed action, protection against the spillage of crude oil, gas, petroleum products, or hazardous substances would be provided. The Department of the Navy currently has established containment and cleanup facilities and procedures for accidental spills that occur, which comply with applicable federal regulations regarding hazardous substances. Therefore, protection against the spillage of crude oil, gas, petroleum products, or hazardous substances would be provided under the proposed action.

Section 30233

An analysis was not prepared for this section since the proposed action does not involve diking, filling or dredging of open coastal waters, wetlands, estuaries or lakes.

Section 30234

No facilities serving the commercial fishing and recreational boating industries would be affected by the proposed ocean tests. The two surface vessels and the barge involved in the tests would operate according to standard open ocean navigation regulations. A Notice to Mariners (NOTMAR) would be provided 48 hours in advance of the ocean tests.

Section 30235

The proposed action does not involve revetments, breakwaters, groins, harbor channels, seawalls, cliff-retaining walls and other such construction that alters natural shoreline processes. The proposed action would not alter natural shoreline processes; therefore, impacts to the natural shoreline would not occur.

Section 30236

An analysis was not prepared for this section because the proposed action does not involve channelizations, dams or other substantial alterations of rivers and streams.

Section 30237

An analysis was not prepared for this section because the proposed action does not involve the Bolsa Chica wetlands or any portion thereof in the County of Orange.

Article 5 – LAND RESOURCES (Sections 30240-30244)

Section 30240

Implementation of the proposed action would not result in disturbance of any identified environmentally sensitive habitat areas.

Section 30241

The proposed action would not impact agricultural lands.

Section 30241.5

An analysis was not provided for this section because the proposed action would not impact the viability of agricultural land.

Section 30242

An analysis was not provided for this section because the proposed action would not impact the conversion of any land suitable for agricultural use.

Section 30243

An analysis was not provided for this section because the proposed action would not impact the long-term productivity of soils and timberland or result in the conversion of coastal commercial timberlands.

Section 30244

Activities associated with the test would occur entirely within the marine environment. There is no potential for underwater archaeological resources to be affected by the Plasma Sound Source Ocean Test.

Article 6 – DEVELOPMENT (Sections 30250-30255):

Section 30250

The proposed action would not involve development of residential, commercial or industrial facilities.

Section 30251

Implementation of the proposed action would not affect the existing visual quality of coastal areas.

Section 30252

As discussed in Section 30210, the proposed action would not impact existing or future public access to coastal areas. Refer to Section 30210 for a detailed discussion of public access.

Section 30253

The proposed action would not involve development in areas of high geologic, flood or fire hazards.

An air quality analysis was performed for the proposed action, which concluded that emissions associated the proposed test would be below *de minimis* levels or not subject to the General Conformity Rule; therefore, the General Conformity Rule is not applicable to the proposed action.

An analysis was not performed for minimized energy consumption and vehicle miles traveled since the proposed action does not involve an increase in personnel.

As discussed in Section 30220, the proposed action would not impact popular visitor destination points for recreational uses.

Section 30254

An analysis was not provided for this section because the proposed action does not involve new or expanded public works facilities.

Section 30254.5

An analysis was not provided for this section because the proposed action does not involve development of a sewage treatment plant.

Section 30255

An analysis was not provided for this section because the proposed action does not involve coastal development.

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